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Review Article

The impact of stock market capitalisation, international investment, clean energy on CO_2 emissions: New insight from listed domestic companies in Belgium

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Abstract

The paper fundamentally explores the impact of Belgium's stock market capitalization, international investment, clean energy on CO_2 emissions from 1990-to 2018. More pertinently, our study analogizes the diverse impact of Belgium's stock market capitalization, international investment, clean energy, and environmental quality. Through cointegration analysis, stock market capitalization, international investment, clean energy, and environmental quality have long-run links. Granger causality test indicates that International investment has a unidirectional relationship with environmental quality; clean energy has a bi-directional relationship with environmental quality. Via the static and dynamic regression, we found that stock market development has the most significant impact on carbon dioxide emissions in static and dynamic regression. Renewable energy has a positive impact on the carbon dioxide emissions per static, and dynamic regression and economic growth harm environmental quality in Belgium. The impulse response function results show that the Stock market and international investment positively respond to environmental quality. Our empirical findings provide policies to advocate improving environmental quality in Belgium.

Introduction

Humankind has moved to every corner of the globe, thriving in the harshest of environments. Thanks to scientific findings passed through generations, men and women lived in these harsh environments. However, throughout the last few generations, and sometimes even rapidly, the climate has been shifting all across the world. Our scientist revealing is already becoming outdated every day. If we stick to our old habits without identifying new ways to solve an environmental problem, we will become increasingly susceptible.

The easy shift towards a more reliable economy and social system demands the development of sound and viable financial systems. Fundamentally, the financial system is comprised of the capital market and banking sector. In advanced economies, the primary driver of the financial system is the stock market. The aim of examining stock market capitalization's role in ensuring a quality environment in Belgium through the channels of international investment and clean energy is motivated by several pertinent factors.

First, international investment can induce demand for energy and a quality environment. For instance, international investment encompassing stock market development boosts economic activities via mobilizing capital; a more significant inflow of international investment subsequently encourages demand for energy and carbon dioxide emissions. Extant studies opine that international investment encourages economic growth and indirectly minimizes environmental quality. International investment promotes energy demand, making it easier for consumers to take loans to make essential

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purchases in life, such as houses, household appliances, and cars. The stock market allows firms to acquire equity and capital for their portfolios which ultimately supports activities in many distinct sectors, including research and development, renewable energy, and production sectors Zeqiraj, Sohag Soytas 2020; Javid and Sharif 2016; Sadorsky 2010) [1].

The stock market is an additional crucial aspect linked to environmental sustainability. As a leading economic indicator, stock market value forecasts future economic growth. Businesses find it quite appealing to invest in the stock market. The stock market, which is established, tightens the wealth effect, which affects business and consumer self-confidence in the long run. Increased stock market activity is seen as an indication of wealth creation for a country. Many studies emphasize the necessity of assessing the impact of international investment and clean energy on carbon dioxide emissions (Don and Seker 2016; Khan 2019; Acheampong 2020; Zeqiraj, Sohag and Soytas 2020).

Clean energy reduces carbon dioxide emissions [2,3]. Since they reduce CO_2 and other greenhouse gasses, renewable energies have no negative impact on the environment; there is no restriction on their usage. The ever-increasing demand for clean energy production and expansion is essential for emerging countries' sustainable development. The Belgian government is fully dedicated to reducing greenhouse gas emissions and preventing global warming. The Kyoto Protocol and the United Nations Framework Convention on Climate Change were signed and confirmed by the USA in 1992 and 1996, respectively. Having signed the Kyoto Protocol Joint Implementation Agreement (1998) with its E.U. partners, Belgium has pledged to make every effort to meet its obligations under the protocol. Despite signing the Kyoto Protocol to reduce greenhouse gas emissions, Belgium still has significant environmental issues, given the region's high economic growth rates.

Nevertheless, few empirical studies examined the result of stock markets on environmental quality in Belgium, although the apparent rise in the stock market's economic activities has a significant impact on Belgium's environment. This study uses listed domestic companies in Belgium to represent the stock market impact on the environment that is missing in extant studies. Moreover, similar to this study is Younis, et al. [2]; our study expanded the literature by examining the impulse response function relationship between the stock market and environmental quality, distinct from the previous studies investigating the link between the stock market and the stock market. The impulse response association can uncover whether the positive or negative shocks of stock markets development on environmental pollution have different effects in the future. The issues mentioned above triggered the study into the impact of stock market capitalization on the environmental quality of listed domestic companies in Belgium. This study also provides in-depth insight into the increased interaction of the stock market and international investment on Belgium's environmental pollution. This is the first study in pollution activities literature in Belgium that incorporates clean energy and international investment as independent variables. This study will help policymakers offer more specific policies to control environmental pollution levels generated from the stock market activities. This study will provide replacement perspicuity to policymakers in Belgium and advancing economies.

Literature review

Stock market and environmental quality

Zeqiraj, Sohag, and Soytas's (2020) study on stock market development and low-carbon economy in E.U. countries from 1980- to 2016 found that the stock market fosters a low carbon economy. Goutte, Guesmi, Mhadhbi, and Gallali's [4] study concentrated on finding the asymmetric link between stock market development, energy efficiency, and environmental quality via a nonlinear analysis. The finding from the study indicates that positive and negative shocks on stock market indicators minimize environmental quality by deepening environmental pollution. Topcu, Tugcu, and Oscal [5] concentrated on how environmental degradation reacts to stock market development in developing countries spanning from 1990-to 2014 in a panel of sixty developing countries. From disclosure stock market decreases environmental degradation in the short and long run. Habiba, Xinbang, and Ahmad [6] study tackled stock market and financial institution development on CO_2 emissions with the merit of clean energy usage and international investment in G20 economies from 1981 to 2017 via the CCEMG model. Findings indicate that the stock market improves the quality of the environment in advanced countries while the stock market decreases, environmental quality is minimized in developing economies. Younis, Naz, Shah, Nadeem, and Longsheng (2021) examined the impact of the stock market, clean energy usage, and urbanization on CO_2 emissions in BRICS economies from 1993-to 2018. The study revealed that stock market capitalization increased CO_2 emissions in China, India, Russia, and South Africa. In the same study, the stock market is positively related to Brazil's environmental pollution. Sharma, Shahbaz, Sinha, and Vo [7] examined stock market development and carbon intensity from south Asian countries spanning from 1990-to 2016 via the CS-ARDL approach. Findings from the study indicate that stock market development increases carbon intensity.

Stock market and international investment

Adam and Tweneboah [8] utilized multivariate cointegrations and error correction models to assess the impact of foreign direct investment on stock market development in Ghana. Finding from the study indicates that international investment influences stock market development. Studies by Tsagkanos, Siriopoulos, and Vartholomatou [3] on international investment and stock market development in new emerging countries spanning from 2013 -to 2014 indicate a weak positive symmetric long-run relationship between international investments and stock market development. The study disclosed that the link is significant in the first sub-period but insignificant in the second. Markov switching regression model was confirmed by the study findings. Utilizing the Granger causality test, Malik and Amjad [9] analyzed foreign direct investment and the stock market in Pakistan from

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1985 to 2011. The result from the study advocates the positive role of international investment in boosting stock market development aggregate in the long run.

Shi, Bilson, and Powell [10] examined whether international investment between economies fosters stock market integration. The study reiterated that the flow and the level of bilateral international investment among economies explain country per stock integration. Specifically, high bilateral international investment levels and flows increase Australia's stock market integration with its main trade partners. Pradhan, Rudra, Mak, Arvin, and Hall [11] tackled the nexus between economic growth, stock market depth, trade openness, and foreign direct investment from 1961to 2012 in twenty-five ASEAN regional forum economies. Finding from the study indicates unidirectional causality between the stock market and international investment. In a working paper by Lipsey [12] on international investment and operation of multinational firms; concept history and data indicated that the stock market and international investment impact each other. Agbloyor, Abor, Adjasi, and Yawson [13] utilized the proxies for the banking sector and stock market to capture financial development in exploring the nexus between the financial market and international investment in Africa from 1970 to 2007. The study indicates that international investment leads to the development of the domestic stock market. The study added that countries with the more developed stock market are likely to attract more international investment. November and Cardoso de Mendonca [14] examined the determinants of foreign direct investment in developing countries from 1975 to 2005 in thirty-eight developing countries. The result indicates that international investment is closely associated with stock market development. According to Kaur, Yadav, and Gautam [15], the study on financial system development and international investment for BRICK countries spanning from 1991-to 2019 stresses that the stock market capitalization positively influences international investment. Azam and Ibrahim [16] employed the ARDL bounce test to analyze international investment and the Malaysia stock market from 1988 to 2012. The result from the study indicated that foreign direct investment positively influences stock market development. The positive reflection indicates the complementally role of flows of FDI in stock market capitalization. Hajilee and Nasser [17] study evaluated the financial market development of international investment in fourteen Latin American countries by utilizing the banking sector and the stock market indicators to capture financial market development. The identified bi-directional link between stock market development and foreign direct investment.

Stock market and clean energy

Paramit, Ummala, and Apergis's [18] Study examined the impact of foreign direct investment inflows and stock market capitalization on clean energy across 20 emerging countries from 1991 to 2012. The non-causality test result indicates that the stock market positively impacts renewable energy consumption in emerging countries. Zeqiraj, Sohag, and Soytas [1] study on stock market development and low carbon economy for E.U. member countries from 1980-to 2016. Per the CS-ARDL approach, stock market development minimizes carbon intensity via the channel of clean energy such as production and consumption. Mroua, Bouattour, and Naifar (2021) study the dynamic link between clean energy, commodities, financial market, and its implication for portfolio diversification across distinct financial market conditions. The dynamic spillover approach indicated net emitters of shocks to the stock market. Paramati, Mo, and Gupta (2017) analyzed the effect of stock market growth and clean energy utilization on carbon dioxide emissions from G-20 countries spanning 1992-2012. The study revealed the link between the variables by stating any link between the stock market and renewable energy. Razmi, Bajgiran, Behname, Salari, and Razmi's (2019) study provided the nexus between clean energy consumption to stock market development and economic expansion in Iran spanning from 1990 to 2014. The study indicated that the stock market affects renewable energy in the long run in Iran, according to the ARDL approach. Via the ARDL approach, Rezagholizadeh, Aghaei, and Dehghan (2019) study analyzed foreign direct investment, stock market development, and renewable energy consumption in Iran from 1978 to 2016. The research depicts a causal link between the stock market and renewable energy consumption in Iran. Based on the literature, we can vehemently confirm that the Stock market and renewable energy have not been studied in-depth.

Data and methodology

The study analyses the impact of stock market capitalization, international investment, clean energy on CO_2 emissions: new insight from listed domestic companies in Belgium. We computed stock market capitalization by using the market capitalization of listed domestic companies (Current USD). We use renewable energy consumption (% of total final energy consumption) as clean energy. Environmental quality is represented by CO_2 emissions from gaseous fuel consumption (% of total). Economic growth is GDP per capita (Current USD). International investment incorporates foreign direct investment, net (BoP, current USD).

Stock Market capitalization (S.M)

Market capitalization, also known as market value, is the share price times the number of shares outstanding, including several classes for listed domestic companies; investment funds, unit trust, and companies whose only business goal is to hold shares of their listed companies are excluded. Data are end-of-year values converted to U.S. dollars using corresponding year-end foreign exchange rates.

Clean Energy (C.E.)

Clean energy consumption is the share of renewable energy in total final energy consumption. Proxied as (% of total final energy consumption).

International Investment (II)

Foreign direct investment is the net inflows of investment to acquire a lasting management interest (10 percent or more

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investment of voting stock) in an enterprise operating in an economy other than that of the investor. The balance of payments shows the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital. This series shows total net FDI.Net FDI outflows are assets minus changes in liabilities. Data is in current USD.

Environmental Quality (E.Q.)

Carbon dioxide emissions from liquid fuel consumption refer mainly to emissions from natural gas as an energy source.

Economic Growth (E.G.)

GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without deductions for depreciation of fabricated assets or depletion and degeneration of natural resources. Data are in current U.S. dollars.

Therefore to examine the impact of international investment and clean energy in mitigating CO_2 emissions in Belgium, the relationship between CO_2 emissions, stock market development, international investment, clean energy consumption, and economic growth can be estimated as follows:

$$\mathrm{Ln}(CO_2)_t = \beta_0 + \beta_1 \ln SMC_t + \beta_2 \ln II_t + \beta_3 \ln CE_t + \beta_4 \ln EG_t + \mu_t \quad (1)$$

Correlation analysis is utilized to explore the pooled link between two distinct variables. Its computation is done in Equation:

$$Corr(YZ) = \frac{\mathrm{Cov}(YZ)}{\sqrt{\mathrm{Var}(Y)\,\mathrm{Var}(Z)}} \quad (2)$$

Where Cov(Y, Z) means the covariance between variable Z and Y, Var(Y) and Var(Z)denote the variable's value of (Y) and (Z) accordingly. In the situation where the correlated value is close or vice versa.

Augmented Dickey-Fuller (ADF) and Phillips and Perron (PP) unit root tests are often used to examine whether time series data is stationary vice versa. Our study considers the below three (3) distinct models (M) by ADF:

$$M1: \Delta y_t = \Delta y_{t-1} + £_t \quad t = 1,2.....,T. \quad (3)$$

$$M2: \Delta y_t = \Delta y_{t-1} + \alpha + £_t \quad t = 1,2.....,T. \quad (4)$$

$$M3: \Delta y_t = \Delta y_{t-1} + \alpha + \lambda t + £_t \quad t = 1,2.....,T. \quad (5)$$

There is no constant trend in M1. M2 contains constant. M3 contains constant and trend.

The null hypothesis is H_o:$\varphi<0$; the alternate hypothesis is H_1:$\varphi<0$. The null hypothesis indicates that time series is nonstationary with at least one unit root. The alternative hypothesis depicts that the time series is stationary without a unit root.

Following Long, Namine, Du and Zhuang 2015 [19]; Granger, et al (1980) the causal nexus of two variables X and Y is depicted as follows:

$$Y_t = \Sigma_{i-1}^{\Omega}\ \alpha_{1i} Y_{t-1} + \Sigma_{p-1}^{\Omega}\ \beta_{1p} Z_{t-p} + \varepsilon_{1t} \quad (6)$$

$$Z_t = \Sigma_{i-1}^{\Omega}\ \alpha_{2i} Y_{t-1} + \Sigma_{p-1}^{\Omega}\ \beta_{2pt-p} + \varepsilon_{2t} \quad (7)$$

Where Y_{t-i} and Z_{t-i} depict the lagged variables of Y and X accordingly, there are four (4) distinct links between Z and Y. Causal link of "Z ↔Y ."When $\beta_{1p}\neq 0$. [Example p+1,--,Ω] and $\alpha_{2i}=0$[for all i=1,--Ω];a causal nexus of "Z↔ Y", when $\beta_{1p}=0$, [for all p=--,Ω] and $\alpha_{2i}\neq 0$, [for some i=1,--,Ω];a causal link of Z ↔ Y, when $\beta_{1p}\neq 0$, for some p=1,--,Ω *or* $\alpha_{2i}\neq 0$, for some i=1,--,Ω;a causal link of Z ↔Y, when $\beta_{1p}=0$ for all p=1,--,Ω and $\alpha_{2i}=0$, [for all i=1,--,Ω].

Result and discussion

Our study implements a unit root test, cointegration analysis, Granger causality analysis, static- dynamic regressions, and impulse-response-function to assess the nexus between stock market capitalization, clean energy, environmental quality, international investment.

Table 1 shows that CO_2 has the lowest standard deviation, 0.104, while international investment has the highest standard deviation. Different variables have significant heterogeneity for carbon dioxide emissions. The result shows that CO_2 produces 1.4 metric tons of emissions as a mean and a maximum of 1.5 metric tons of pollutants per year. Moreover, the mean growth per year was 4.5% and a maximum of 4.4%. Renewable energy consumption has a mean of 0.4% and a maximum of 4.1% metric tons per year.

Per the correlation estimation in Table 2, the correlation coefficient of carbon dioxide emissions is 0.915, which depicts that the specific economic growth of Belgium comes from environmental degradation. When we compare the four variables, our study found that clean energy and GDP have

Table 1: Descriptive Statistics.

Variable	Mean	Std.Dev	Minimum	Maximum
LMT	11.292	0.267	10.807	11.641
$LnCO_2$	1.438	0.104	1.233	1.5567
LnII	2.826	4.661	0.000	10.517
LnEG	4.517	0.134	4.314	4.482
LREC	0.442	0.371	-0.027	1.027

Table 2: Correlation Analysis.

	LnSMT	LnFDI	LnGDP	LnREC	LnCO2
LnSMT	1.0000				
LnFDI	0.452	1.0000			
LnGDP	0.819	0.570	1.0000		
LnREC	0.807	0.656	0.906	1.0000	
$LnCO_2$	0.915	0.489	0.901	0.864	1.0000

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the closest correlation with CO_2 emissions, while international investment has fallen behind.

Unit root

The study data expands from 1990-to 2018, covering twenty-eight years, in that different years have unique disturbances. An extensive period of panel data tends to experience stochastic drift. The unit root is associated with the following drawbacks. Nonstationary panel data are incompatible with the central limit theorem. The t-statistics and hypothesis tests will be ineffective since the t-statistics value does not follow the normal distribution. Unit root test can lead to erroneous regression, in which the regression is no longer reliable. Thus, implementing a unit root test from distinct determinants of CO_2 emissions from 1990 to 2018 in Belgium is more pertinent. Our study use Augmented Dickey-Fuller's [20] and Philips and Peron's [21] approach to analyze whether stock market development, clean energy, international investment, and carbon dioxide emissions in Belgium are stationary. To test for stationarity, we applied unit root evaluation on the log of stock market development, clean energy, international investment, and carbon dioxide emissions. Augmented-Dickey-Fuller and Philips, and Peron use level and fist difference analysis, both included in the unit root test (Table 3). All t-values became stationary at the first difference in ADF and P.P. approach unit root test, which depicts the acceptance of the null hypothesis and shows the presence of unit root. Hence, stock market development, clean energy, international investment, and carbon dioxide emissions are nonstationary and stationary at a level and stationary at the first difference (Table 3), which should be cointegrated.

Cointegration

Cointegration fundamentally examines whether distinct variables have long-run equilibrium nexus. In situations where their link is stationary, it is I(0), Zero other of cointegration; if their link is not stationary, they tend to walk stochastically with drift, which depicts I(1) order of cointegration. Our study utilized the Trace and Max-Eigen test to examine whether the link between Renewable Energy Consumption, international investment, economic growth, stock market capitalization, and environmental quality are stationary in the long run or not. Our study employs Johansen's [22] cointegration to examine whether Renewable Energy Consumption, international investment, economic growth, stock market capitalization, and environmental quality are cointegrated (Table 4). Johansen-cointegration (1988) [22] encompasses trace and Max-Eigen tests. Two lag periods were chosen. When trace test statics are greater than the critical value of 0.05% significant level beneath (none* at most 1 at most 2, at most three and most 4) cointegration, its means rejection of null hypothesis and depicts the stationarity presence. Nevertheless, when the trace statistics are > or less than the critical value at 0.05% significant beneath none, at most 2,3 and 4 cointegrations, we failed to reject the null hypothesis indicating nonstationary. When Max-Eigen statistics are more than the critical value at 0.05% significant beneath none, at most 1,2,3 and 4 cointegrations, we reject the null hypothesis, which depicts the presence of stationarity.

Table 3: Unit root test.

Variable	Augmented Dickey-Fuller (ADF)			
	Level		First-difference	
	C	C&T	C	C&T
LMT	1.029	-5.732***	-1.806	-3.308*
$LnCO_2$	1.083	-1.530	-1.934	-7.154***
LnII	-3.268*	-5.051**	-6.519***	-6.724***
LnEG	-1.034	-2.805	-4.047**	-3.985*
LLC	0.449	-1.087	-3.862**	-4.044**
	Phillip-Peron (P.P.)			
	Level		Intercept	
	C	C&T	C	C&T
LMT	1.147	-5.735***	-1.776	-6.353***
$LnCO_2$	2.802	-2.844	-5.364***	-10.435***
LnII	-3.205*	-5.455***	-16.196***	-20.656***
LnEG	-1.074	-8.824	-3.980**	-3.907**
LLC	0.747	-2.887	-3.876**	-4.068**

Test critical values: 1%, 5% and 10% level. (*,**.***)

Table 4: Cointegration estimation.

Trace test				
Number of Cointegrations	Eigenvalue	Trace Statistics	5% Critical level	Prob.**
None	0.708	83.433	69.819	0.002
At most 1	0.646	50.213	47.856	0.029
At most 2	0.371	22.165	29.797	0.289
At most 3	0.208	9.632	15.494	0.310
At most 4	0.116	3.333	3.841	0.067
Max-Eigen test	Eigenvalue	Max-Eigen Statistics	5% Critical level	Prob.**
None	0.708	33.219	33.877	0.059
At most, 1*	0.646	28.048	27.584	0.044
At most 2	0.371	12.532	21.132	0.436
At most 3	0.208	6.299	14.265	0.575
At most 4	0.116	3.332	3.841	0.067

Note:*depicts rejection of the hypothesis at the o.05 significant level.

Nevertheless, when the Max-Eigen statistics are > than the critical value at 0.05 significance beneath none, at most 2,3 and 4 cointegrations, we failed to reject the null hypothesis, which depicts non-stationarity. Therefore, the Trace and Max-Eigen statistics results depict at least one cointegration link between renewable Energy Consumption, international investment, economic growth, stock market capitalization, and environmental quality. The findings align with Long, et al. [19] study found at least one cointegration link between renewable Energy Consumption and economic growth.

Granger causality

Granger causality test is employed to test whether two distinct variables have a collaborative relationship or not. Thus one-way granger causality links, bidirectional relations, no existence of collaborative links. Our study utilized the Granger

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causality approach to test whether clean energy, international investment, economic growth, stock market capitalization, and environmental quality have a two-way effect or not. Per the Granger causality [23] analysis in Table 5, international investment has a unidirectional relationship with environmental quality. They are indicating that international investment is enhancing in reducing co2 emissions. These findings are in line with Ahmad, et al. [24]; Hao, et al. [25]; Farooq, et al. [26]; Ansari, et al. [27]; Ojewuni and Akinlo [28]; Shahbaz, et al. [29]; Jiang [30] and Seker, et al. [31]. Contrary, Zafar, et al. [32]; Mehmood [33] found that international investment increases environmental pollution. Economic expansion has no bi-directional relationship with Environmental quality. Clean energy has a bi-directional relationship with environmental quality. Clean energy can improve environmental quality, which can smooth the sustainable development goals of Belgium. This finding is inside with Riti, et al. [34], Sarkodie and Adams [35], Rahman [36]; Salahuddin, et al. [37]; Khan, et al. [38]; Murshed, et al. [39], and Mehmoood (2021). On the other side of the coin, Ike, Usman, Alola, and Sarkodies [40] study findings indicated that clean energy consumption has an adverse implication on the environment in G-7 economies. Therefore it is pertinent to minimize carbon dioxide emissions to advance the low-carbon economy in Belgium. Besides, stock market capitalization has a unidirectional relationship with environmental quality; renewable energy consumption has a unidirectional relationship with international investment.

Static-dynamic regression analysis

Static combined with a dynamic regression test is conducted on the determinant of carbon dioxide emissions (Table 6). The dynamic regression approach examines the dynamic effect of stock market capitalization, international investment, and clean energy on environmental quality. The regression analysis from 1990 to 2018 found that stock market development significantly affects carbon dioxide emissions in static and dynamic regression. It depicts that stock market development is prevailing in Belgium. Hence, the stock market can ensure environmental quality in Belgium.The findings side with Gouthe, et al. [41], who indicated in their study that all forms of shocks in the stock market reduce CO_2 emissions. Contrary, Sharma, et al. [7]; Mhadhbi et al. [42] study indicated that the stock market intensifies CO_2 emissions in south Asia and emerging markets, while Topcu, et al. [42] also indicated that stock market development minimizes cos emissions in the short term and exacerbate environmental quality in the long run in developing economies. According to the static and dynamic regressions, Belgium's economic growth hurts environmental quality. Due to the expansion in the economy in Belgium, anthropogenic activities are exacerbating the quality of the environment. It might be that factories activities are polluting the environment due to a large number of factories due to economic expansion. Renewable energy has a positive impact on the carbon dioxide emissions per static and dynamic regression. Therefore Belgium must encourage the utilization of clean energy immensely in Belgium. International investment hurts carbon dioxide emissions in Belgium. It might be that as Belgium's economy is booming, it attracts more investors, and the activities of international investors minimize the quality of the environment.

Table 5: Granger causality estimation.

Null Hypothesis	Obs.	F-statistics	Prob.
LNFDI ≠ $LNC0_2$	27	0.063	0.939
$LNCO_2$ ≠ LNFDI		3.088	0.066
LNGDP ≠ $LNCO_2$	27	0.258	0.774
$LNCO_2$ ≠ LNGDP		1.691	0.207
LNREC ≠ $LNCO_2$	27	3.429	0.050
$LNCO_2$ ≠ LNREC		8.923	0.001
LNSMT ≠ $LNCO_2$	27	3.428	0.051
$LNCO_2$ ≠ LNSMT		2.576	0.099
LNGDP ≠ LNFDI	27	0.122	0.098
LNFDI ≠ LNGDP		2.576	0..099
LNREC ≠ LNFDI	27	6.863	0.0048
LNFDI ≠ LNREC		0.173	0.842
LNSMT ≠ LNFDI		2.409	0.113
LNFDI ≠ LNSMT		1.422	0.263
LNREC ≠ LNGDP	27	0.570	0.573
LNGDP ≠ LNREC		2.713	0.088
LNSMT ≠ LNGDP	27	1.016	0.378
LNGDP ≠ LNSMT		1.263	0.302
LNSMT ≠ LNREC	27	1.799	0.188
LNREC ≠ LNSMT		0.618	0.548

Table 6: Static and Dynamic regression estimation.

Period 1900-2018					
Static Regression			Dynamic Regression		
Variables	t-statistics	Std. Error	Variables	t-statistics	Std. Error
Constant	3.887***	0.577	Constant	-3.888***	0.578
LnSMT	4.569***	0.001	ΔLnSMT	4.570***	0.043
LnREC	0.726***	0.119	ΔLnREC	0.726**	0.004
LnGDP	-2.607**	0.046	ΔLnGDP	2.607	0.119
LnFDI	-0.616**	0.726	ΔlnFDI	-0.615***	0.002
Obs.	29		Obs.	29	
R-Square	0.91		R-Square	0.91	

***,**,* depicts the significant level of 1%,5% &10%.Δ indicate differences.

Impulse-response-function

The response from CO_2 emissions will minimize stock market development, international investment, and economic growth in Belgium (Figure 1). The response of carbon dioxide emissions will decline towards GDP per capita in Belgium. This indicates that as Belgium's economy is experiencing massive growth, Belgium needs to intensify measures to abate environmental pollution. The stock market has a positive impact on environmental quality. Belgium needs to massively develop its stock market activities to meet the net-zero Agenda. International investment has a positive response to CO_2 emissions. As Belgium attracts more foreign direct investment, environmental pollution will likely decline.

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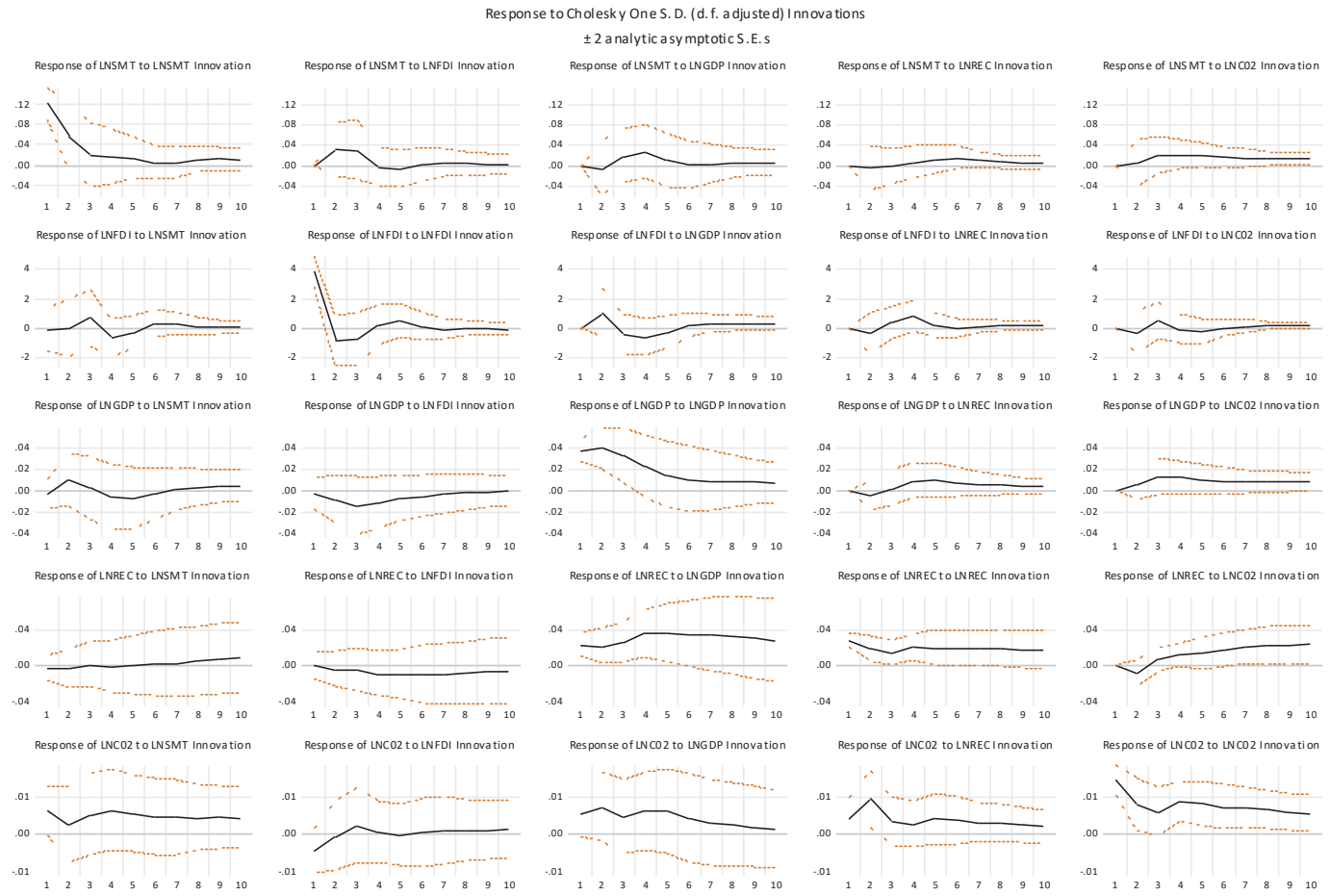

Figure 1: Impulse-response-function.

Therefore measures attached to investing in Belgium should strengthen clean energy resources.

Conclusion and policy implication

This paper ultimately explores the impact of Belgium's stock market capitalization, international investment, clean energy, and environmental quality from 1990 to 2018. More pertinently, our study analogizes the diverse impact of Belgium's stock market capitalization, international investment, clean energy, and environmental quality. Via unit root, we find that stock market capitalization, international investment, clean energy, and environmental quality are stationary. Through cointegration analysis, stock market capitalization, international investment, clean energy, and environmental quality have long-run links. Via the Granger causality test, we found that International investment has a unidirectional association with environmental quality; clean energy has a bi-directional relationship with environmental quality. Via the static and dynamic regression, we found that stock market development has the most significant impact on carbon dioxide emissions in static and dynamic regression. Renewable energy has a positive impact on the carbon dioxide emissions per static, and dynamic regression and economic growth hurt environmental quality in Belgium. The study found that the Stock market and international investment positively respond to environmental quality through the impulse response function. We tried to recommend a few policy directions per the empirical analysis. The static and dynamic regression revealed that clean energy positively impacts carbon dioxide emissions. Therefore Belgium should make considerable support for clean energy to minimize the growing tendency of CO_2 emissions and pursue a more viable economic growth path. The Belgium government should increase the total energy produced and consumed from clean energy sources. Per the impulse response function, our study found that the stock market and international investment positively respond to environmental quality. The policy recommendation is that the government consider maintaining conservative macroeconomic measures while also building a welcoming legal climate to promote the flow of international investment and reinvestment of excess with that stock market, and economic expansion could be boosted. To maintain the international investment, Belgium's stock market must be revamped in the long run, and the institutional regulatory framework must remain strengthened.

Authors Contributions

BAA wrote the methodology's introduction section, interpreted the data with the conclusion, and EAB supervised the entire work. All authors'(s) read and approved the final manuscript.

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Availability of data and materials

The data used and/ or analyzed during the current study are available from the corresponding author on reasonable request.

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